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Electronic Business

MICROSOFT FIGHTS TO STAY AHEAD

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Chairman Bill Gates and president Michael Hallman of Microsoft

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES—WORLDWIDE

VOL. 16, NO. 21

NOVEMBER 12, 1990

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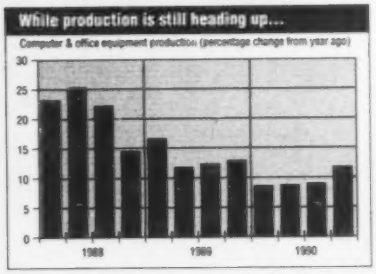

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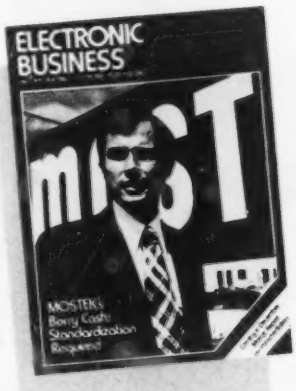
Perspective: a rare quality

Things change, and in the electronics and computer industries the changes come with lightning speed. The pace of change makes this kind of journalism fun, but it also can make it hard to gain perspective, especially if one wants that perspective to include the entire 15 years (as of this issue) that ELECTRONIC BUSINESS has been published. Fortunately, we can call on consulting editor Alberto Socolovsky to provide that broad perspective, as he does in his commentary: "15 years of Electronic Business."



Alberto was this magazine's editor during most of the 1980s. When he was asked to take the job by Vic Drumm, the first ELECTRONIC BUSINESS publisher, he was already a veteran of the electronics industry, having worked as an engineer, editor, and market researcher. He had witnessed the birth of the companies that led development of integrated circuits, minicomputers, and microcomputers.

Alberto recalls, "Like Berry Cash [the Mostek exec whose photo graced our first cover] and like Ralph Waldo Emerson, with his 'better mousetrap,' I believed that new technology automatically created new markets, that all you had to do was come up with technologically advanced new products and your sales were guaranteed. And, why not? That's exactly what was happening with the Department of Defense market."

Then came the military budget cuts of the early 1970s, followed by a recession (sound familiar?). Alberto says that, as an editor of a magazine that soon became a victim of that recession, "I began to wonder for the first time how the technology I was writing about was going to provide jobs for my readers."

Alberto calls his arrival at ELECTRONIC BUSINESS a case of being in the right place at the right time. In the early 1980s, the magazine chronicled a period of unsurpassed growth for the electronics industry, thanks largely to the rise of personal computing and advances in communications technology. Alberto left the magazine as a full-time editor in 1988 to start his own company, marketing an expert system developed by his daughter and her husband.

Combining business and electronics in one magazine was considered a radical move back in 1975. "The electronics industry of the 1990s calls for even more of a business magazine than in '75," says Alberto. "Particularly, it calls for a magazine with a worldwide outlook." Given Alberto's unique perspective, we consider that sound advice.

JOHN W. PARKER, section editor

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BPA ABP

Vital signs: How the U.S., Europe, and Japan compare

	Electronic revenues ($ billions)	Total consolidated revenues ($ billions)	Net income before tax as a percentage of revenues	Net income after tax as a percentage of revenues	Return on equity	Return on investment	Revenues per employee	Net income before tax per employee	
North America	275.6.	586.1	8.7%	5.5%	13.3%	6.9%	$136,384	$11,867	
Europe	129.3	277.7	6.9%	4.2%	13.6%	7.5%	$102,383	$7,068	
Asia	209.4	317.0	6.3%	3.5%	9.4%	4.9%	$171,788	$10,844	
International 100	614.3	1,180.7	7.6%	4.6%	12.3%	6.5%	$133,346	$10,184	

All data is weighted averages except electronics and total revenues
• Some companies do not have complete data

The Electronic Business International 100

ELECTRONIC BUSINESS introduces its first annual financial list of the 100 largest international electronics corporations

BY BRUCE C.P. RAYNER AND LINDA STALLMANN

The term "global" has been overused. All industries—but electronics in particular—have become global out of necessity. The impact of internationalization on the corporation (namely changing corporate structures and market strategies) will challenge executives into the next century. Today's leading international companies are taking the first steps toward confronting these issues.

Who are these leading companies? According to the first annual ELECTRONIC BUSINESS listing of the largest 100 electronics companies in the world, almost three-quarters make their home in either the United States or Japan. Britain and Germany, each with five companies, are the nations with the next largest numbers of electronics world leaders.

Christopher Bing

In terms of electronics revenue, North American companies—46 from the United States and 1 from Canada—account for 45% of the electronics-related revenue of these top 100 companies. The 30 Asian companies on the list represent 34% of the total, while the 23 European companies account for the remaining 21%.

In terms of profits, again it is North American companies that lead the pack. In total, North American companies made $51 billion before taxes, compared with $20 billion for Asian companies and $19 billion for European companies. However, not one Asian company—27 of the 30 Asian companies on the list are Japanese, the other 3 are South Korean—reported losses last year. Six of the 8 companies on the list that lost money last year were U.S.-based; the other two were European.

Not surprisingly, IBM, with close to $63 billion in

	Fixed assets per employee	Investments as a percentage of revenues	R&D as a percentage of revenues	Capital expenditures as a percentage of revenues	Capital expenditures to net cash flow after dividends	Percentage of total capital	Current ratio
	$46,568	14.5%	5.9%	8.5%	100.5	48.0%	1.34
	$29,848	14.2%	6.6%	7.5%	89.3	44.6%	1.60
	$62,729	13.6%	4.9%	8.7%	105.2	47.7%	1.40
	$44,814	14.2%	5.8%	8.4%	97.3	47.3%	1.43

Source: ELECTRONIC BUSINESS

electronics-related revenue last year, towers over its electronics brethren. Even second-ranked Matsushita Electric Industrial Co. is less than half the size of Big Blue in terms of revenue and not nearly as profitable. Also in terms of investment—both for capital equipment expenditures and R&D—IBM reigns supreme with $13.2 billion, seconded by Japan's Nippon Telephone and Telegraph with $10.4 billion. Ford Motor Co. runs a close third with $9.9 billion.

But consider the statistics for the top 10 companies on the list: Of the $238 billion in electronics revenue that these giants generated last year, the 6 Japanese companies in this group represent almost half the total top-10 revenue. What's more, it is Asian companies that excel in terms of productivity.

In Asia, revenue per employee, a measure of productivity, averages $35,000 above the U.S. average and $70,000 above the average in Europe. While the productivity rates of the United States and Japan appear to be slowly converging (see the Oct. 29 issue of ELECTRONIC BUSINESS), the degree of difference remains sizable.

Likewise, assets per employee—a measure of automation and a determinant of productivity—is much higher in Japan than in either the United States or in Europe. And the ratio of capital expenditures to net cash flow, a measure of capital regeneration, is higher in Japan than in both the United States and Europe.

Regional averages, while important for determining broad trends, often mask individual company achievements. For example, of the top five most productive companies on the list, four are U.S.-based. The top company in terms of revenue per employee, with a phenomenal $400,790, is Japan's Casio Computer Co., ranked 80th in total revenue. Next in the revenue-per-employee category is Apple Computer Inc. (#34 in total revenue), Compaq Computer Corp. (#55), Amdahl Corp. (#75), and DuPont (#68). □

The ELECTRONIC BUSINESS International 100 is an exclusive report by ELECTRONIC BUSINESS magazine on the 100 largest publicly held international computer and electronics manufacturers. The listing was derived by analyzing company financial statements, 10-K reports, and annual reports, as well as through executive interviews and estimates by the editors.

Notes to the top international electronics companies

Electronics revenue: Represents ELECTRONIC BUSINESS' estimate of the revenue earned by each company from the sale of electronics products. The figure shown is based on the latest fiscal year, thus a variety of accounting periods are represented.

Similarly, the electronics revenue and other financial data have been translated to U.S. dollars using various exchange rates based on the companies' fiscal years

Net income: Net income is income from continuing operations and before extraordinary items

Return on equity: ROE is net income after taxes as a percentage of shareholders' equity (preferred stock, capital stock, surpluses, and retained earnings at the company's year-end)

Return on investment: ROI is net income after taxes as a percentage of shareholders' equity, plus short-term debt and long-term debt. Short-term debt includes the current portion of long-term debt, notes payable and other borrowings

Fixed assets per employee: Shows the accumulated value (less depreciation) of land, building, plant and machinery, furniture and fittings (including rental equipment) that the company has invested per employee

Investments as a percentage of revenue: Adds together capital expenditures (new investments in fixed assets) and research and development expenses (company-sponsored) as a percentage of revenue

Capital expenditures to net cash flow after dividends: Capital expenditures are measured as a percentage of net income after taxes from continuing operations plus depreciation, minus cash dividends paid

Debt as a percentage of total capital: This includes long-term debt and short-term debt as a percentage of shareholders' equity plus long- and short-term debt

Current ratio: Shows current assets as a proportion of current liabilities, giving a rough indication of the liquidity of the company

Country of origin: Indicates the country in which the company is ultimately registered

Source: ELECTRONIC BUSINESS

Electronic Business International 100

Rank	Company	Electronics revenues ($ millions)	Total consolidated revenues ($ millions)	Net income before tax as a percentage of revenues	Net income after tax as a percentage of revenues	Return on equity	Return on investment	Revenues per employee
1	IBM	$62,710	$62,710	10.6%	6.0%	9.8%	6.8%	$163,640
2	Matsushita	27,313	37,992	9.5%	3.9%	7.4%	4.3%	191,591
3	NEC	21,799	21,799	5.0%	2.5%	10.6%	4.1%	190,216
4	Philips NV	21,078	26,992	2.2%	1.4%	4.1%	1.6%	88,558
5	Siemens	20,290	32,659	4.6%	2.6%	8.5%	6.9%	89,477
6	Toshiba	19,107	26,911	6.3%	3.1%	12.1%	4.6%	189,515
7	Hitachi	17,900	44,797	7.5%	3.0%	8.2%	4.4%	154,472
8	AT&T	16,586	36,112	11.1%	7.5%	21.2%	11.6%	127,379
9	Fujitsu	16,138	16,138	NA	3.4%	NA	NA	140,330
10	Sony	14,760	18,227	7.9%	3.6%	7.2%	3.5%	190,658
11	NTT	13,800	38,116	8.7%	4.3%	6.3%	3.1%	139,669
12	CGE	13,247	22,572	5.3%	3.4%	18.1%	8.7%	107,333
13	Digital Equipment	12,742	12,742	11.1%	8.4%	13.3%	13.1%	101,287
14	Xerox	12,431	12,431	8.2%	3.9%	8.0%	2.9%	125,566
15	Hewlett-Packard	11,899	11,899	9.7%	7.0%	15.2%	11.4%	125,253
16	GM Hughes Electronics	11,359	11,359	8.7%	5.6%	8.0%	7.2%	124,824
17	Thomson	11,184	12,026	2.2%	0.6%	4.0%	1.2%	120,190
18	Unisys	10,097	10,097	-5.5%	-6.3%	-16.5%	-8.1%	122,684
19	Motorola	9,620	9,620	6.7%	5.2%	13.1%	9.3%	92,500
20	Mitsubishi Electric	9,400	18,838	NA	2.6%	NA	NA	211,395
21	General Electric Co.	8,920	40,987	13.9%	9.6%	18.9%	14.8%	140,366
22	Canon	8,400	8,550	6.7%	2.8%	7.0%	3.4%	192,566
23	General Electric Co. plc	7,370	14,153	9.9%	6.2%	23.3%	18.1%	87,362
24	Sharp	7,100	8,658	NA	3.0%	NA	NA	141,240
25	Robert Bosch	6,615	16,277	6.6%	2.0%	9.4%	7.3%	93,150
26	Olivetti	6,586	6,586	3.9%	2.2%	5.6%	2.2%	115,669
27	Texas Instruments	6,522	6,522	5.4%	4.5%	11.7%	9.3%	88,308
28	BCE	6,095	14,086	13.4%	7.2%	12.6%	6.4%	117,386
29	Honeywell	6,059	6,059	11.2%	9.1%	28.7%	20.0%	83,399
30	NCR	5,956	5,956	12.4%	6.9%	20.8%	16.2%	106,357
31	Sansung	5,954	5,954	5.0%	4.0%	22.1%	7.8%	138,457
32	Ericsson	5,534	6,129	8.1%	4.7%	16.7%	11.5%	88,536
33	Raytheon	5,333	8,796	8.6%	6.0%	21.8%	14.5%	113,351
34	Apple Computer	5,284	5,284	14.1%	8.6%	30.6%	29.4%	363,988
35	Groupe Bull	5,133	5,133	-0.5%	-0.8%	-4.6%	-1.6%	117,678
36	Rockwell International	5,029	12,797	9.4%	5.7%	18.5%	13.9%	117,715
37	Sanyo	4,428	8,643	3.4%	1.2%	2.4%	1.2%	155,658
38	Ricoh	4,400	5,288	3.7%	1.9%	4.6%	3.0%	142,912
39	STC	4,269	4,269	10.7%	6.8%	27.0%	21.8%	117,298
40	Eastman Kodak	4,200	18,398	5.0%	2.9%	8.0%	3.1%	133,561
41	Tandy	4,181	4,181	12.6%	7.7%	18.1%	15.3%	110,019
42	Oki	3,987	3,987	4.7%	2.6%	9.1%	3.2%	206,247
43	Lockheed	3,830	9,891	-0.4%	0.1%	0.3%	0.2%	119,891
44	Nokia	3,589	5,627	2.6%	1.2%	8.7%	2.2%	136,247
45	3M	3,297	11,990	17.5%	10.4%	23.1%	18.5%	136,897
46	Litton Industries	3,265	5,023	6.3%	3.5%	14.1%	6.1%	99,069
47	Pioneer	3,239	3,239	12.5%	5.8%	10.1%	8.4%	233,028
48	Martin Marietta	3,188	5,796	7.4%	5.3%	22.7%	16.7%	88,491
49	Intel	3,127	3,127	18.6%	12.5%	15.3%	12.5%	144,094
50	TDK	3,024	3,024	10.7%	4.9%	7.0%	4.8%	136,329

NA = Not available

Net income before tax per employee	Fixed assets per employee	Investments as a percentage of revenues	R&D as a percentage of revenues	Capital expenditures as a percentage of revenues	Capital expenditvres to net cash flow after dividends	Debt as a percentage of total capital	Current ratie	Fiscal year ended	Country of origin
$17,340	$65,088	21.1%	10.9%	10.2%	122.3	30.3%	1.65	12/89	United States
18,248	30,565	11.5%	5.8%	5.8%	79.1	41.2%	1.77	3/90	Japan
9,595	52,894	27.0%	16.1%	11.0%	139.6	61.5%	1.14	3/90	Japan
1,961	28,779	13.5%	8.0%	5.5%	74.8	60.6%	1.58	12/89	Netherlands
4,080	20,348	18.0%	11.2%	6.7%	81.3	18.6%	3.20	9/89	Germany
12,022	40,363	15.1%	6.3%	8.8%	103.2	62.4%	1.25	3/90	Japan
11,567	37,296	15.4%	6.1%	9.3%	312.0	46.3%	1.63	3/90	Japan
14,081	56,152	21.8%	7.3%	14.5%	109.4	45.3%	1.25	12/89	United States
NA	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
15,057	57,474	17.1%	5.7%	11.3%	128.6	50.9%	1.10	3/90	Japan
12,157	225,677	27.4%	4.1%	23.3%	84.7	51.5%	0.78	3/90	Japan
5,682	18,137	12.3%	7.5%	4.8%	73.4	52.1%	1.52	12/89	France
11,293	28,982	21.6%	12.0%	9.6%	69.5	2.0%	2.88	6/89	United States
10,283	10,586	10.0%	6.5%	3.5%	48.2	63.7%	NA	12/89	United States
12,116	30,453	17.9%	10.7%	7.2%	71.1	25.0%	1.53	10/89	United States
10,854	32,877	10.9%	5.2%	5.7%	77.9	10.4%	1.41	12/89	United States
2,634	17,724	11.3%	5.5%	5.9%	138.6	70.2%	1.22	12/89	France
-6,735	22,543	13.8%	7.7%	6.1%	-166.3	50.5%	1.44	12/89	United States
6,212	32,087	19.5%	8.1%	11.4%	104.3	28.8%	1.42	12/89	United States
NA	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
19,531	53,582	8.7%	3.3%	5.4%	55.7	21.3%	NA	12/89	United States
12,985	43,085	12.0%	5.6%	6.4%	91.1	51.0%	1.69	12/89	Japan
8,671	10,620	12.3%	9.6%	2.8%	46.0	22.6%	1.66	3/90	Britain
NA	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
6,190	15,311	12.6%	5.9%	6.7%	94.2	21.9%	2.46	12/89	Germany
4,545	20,731	10.4%	5.3%	5.1%	133.5	60.2%	2.43	12/89	Italy
4,804	28,837	21.0%	7.8%	13.2%	133.1	21.0%	1.88	12/89	United States
15,728	121,678	25.2%	6.0%	19.1%	152.3	49.5%	0.94	12/89	Canada
9,304	16,366	9.1%	4.7%	4.4%	38.2	30.4%	1.16	12/89	United States
13,196	19,714	14.6%	7.5%	7.1%	69.0	21.9%	1.49	12/89	United States
6,889	49,452	21.1%	NA	21.1%	117.3	64.7%	1.05	12/89	South Korea
7,215	17,408	17.7%	10.9%	6.8%	102.5	31.4%	1.80	12/89	Sweden
9,764	18,767	7.8%	3.1%	4.7%	62.2	33.6%	1.10	12/89	United States
51,272	23,023	12.5%	8.0%	4.5%	45.2	3.7%	2.56	9/89	United States
-633	32,340	18.2%	9.0%	9.2%	123.7	65.9%	1.50	12/89	France
11,090	23,862	18.0%	13.3%	4.8%	58.6	24.9%	1.25	9/89	United States
5,308	53,069	11.3%	4.9%	6.4%	111.3	51.1%	1.41	11/89	Japan
5,310	31,238	12.4%	6.0%	6.4%	99.4	35.1%	1.48	3/90	Japan
12,506	20,541	17.3%	10.4%	6.9%	80.2	19.2%	1.35	12/89	Britain
6,715	62,635	18.3%	6.8%	11.5%	175.6	60.7%	1.31	12/89	United States
13,879	11,072	2.9%	NA	2.9%	35.5	15.7%	3.41	6/89	United States
9,657	53,221	17.0%	6.3%	10.7%	95.4	64.4%	1.52	3/90	Japan
-485	23,067	9.1%	5.1%	4.0%	150.6	47.6%	1.17	12/89	United States
3,610	32,103	10.9%	5.1%	5.9%	117.7	75.0%	1.53	12/89	Finland
23,966	42,325	16.4%	6.5%	9.9%	83.2	19.9%	1.98	12/89	United States
6,204	8,911	10.7%	5.4%	5.0%	65.2	56.4%	1.81	7/89	United States
29,061	39,609	9.7%	3.9%	5.8%	62.8	16.8%	2.17	3/90	Japan
6,555	19,862	8.2%	3.3%	4.9%	62.9	26.2%	1.56	12/89	United States
26,867	59,173	25.2%	11.7%	13.5%	67.2	18.2%	2.35	12/89	United States
14,648	51,236	14.4%	5.2%	9.2%	84.4	31.2%	2.23	3/90	Japan

Source: ELECTRONIC BUSINESS

Electronic Business International 100

Rank	Company	Electronics revenues ($ millions)	Total consolidated revenues ($ millions)	Net income before tax as a percentage of revenues	Net income after tax as a percentage of revenues	Return on equity	Return on investment	Revenues per employee
51	**Ford Motor**	$3,017	$82,879	7.3%	4.6%	16.9%	3.5%	$226,076
52	**Control Data**	2,935	2,935	-22.8%	-23.2%	-165.3%	-86.1%	163,028
53	**Allied-Signal**	2,900	11,942	5.8%	4.4%	15.5%	9.1%	111,503
54	**ITT**	2,888	20,054	6.2%	4.6%	11.4%	5.6%	168,521
55	**Compaq Computer**	2,876	2,876	16.8%	11.6%	28.4%	22.6%	302,743
56	**TRW**	2,870	7,340	5.4%	3.6%	15.0%	8.0%	98,789
57	**Wang Laboratories**	2,869	2,869	-9.2%	-11.2%	-28.4%	-15.3%	98,247
58	**Goldstar**	2,863	3,922	1.1%	0.7%	3.5%	1.0%	118,855
59	**Westinghouse Electric**	2,783	12,844	9.9%	7.2%	21.0%	6.2%	105,311
60	**British Telecom**	2,775	19,837	18.7%	12.3%	16.4%	10.5%	80,018
61	**AEG**	2,767	6,516	2.5%	2.2%	13.5%	9.6%	83,831
62	**Asea Brown Boveri**	2,680	20,560	4.4%	2.9%	15.1%	5.9%	108,500
63	**Omron**	2,634	2,634	10.5%	4.7%	9.1%	6.0%	166,490
64	**Alps**	2,549	2,549	1.9%	0.2%	NA	NA	76,622
65	**Boeing**	2,420	20,276	4.5%	3.3%	11.0%	10.5%	127,362
66	**AMP**	2,377	2,797	16.3%	10.0%	17.3%	14.7%	114,616
67	**Kyocera**	2,321	2,665	17.0%	8.0%	7.4%	6.3%	88,825
68	**DuPont**	2,300	35,534	12.2%	7.0%	15.7%	10.4%	243,739
69	**Harris**	2,214	2,214	7.6%	5.2%	12.3%	6.6%	63,067
70	**Emerson Electric**	2,213	7,071	13.3%	8.3%	19.1%	15.4%	97,401
71	**Nippondenso**	2,203	8,248	9.9%	7.4%	7.4%	6.1%	166,997
72	**Seiko**	2,200	2,670	NA	0.4%	NA	NA	166,875
73	**GTE**	2,140	17,424	11.8%	8.1%	16.9%	7.0%	110,281
74	**Pitney Bowes**	2,120	2,876	9.1%	6.3%	12.6%	4.3%	91,571
75	**Amdahl**	2,101	2,101	12.1%	7.3%	13.0%	11.7%	256,234
76	**Fiat**	2,075	36,741	10.2%	6.6%	20.7%	10.8%	128,332
77	**Grundig**	2,062	2,062	3.9%	3.9%	16.4%	15.9%	99,521
78	**Nintendo**	2,022	2,022	26.7%	11.8%	21.8%	21.8%	NA
79	**Memorex Telex**	1,983	1,983	-1.6%	-3.0%	NM	NM	204,470
80	**Casio**	1,929	1,929	5.1%	2.5%	NA	NA	400,790
81	**Bayer**	1,913	23,041	9.5%	4.9%	13.2%	10.6%	135,377
82	**Racal Electronics**	1,861	3,179	10.2%	5.9%	14.0%	8.9%	84,975
83	**Citizen**	1,800	2,117	6.6%	2.9%	7.3%	NA	126,972
84	**Daewoo**	1,779	7,117	5.6%	4.5%	24.1%	10.3%	NA
85	**Sun Microsystems**	1,765	1,765	4.4%	3.4%	9.2%	6.6%	172,939
86	**Minolta**	1,759	2,199	NA	1.1%	NA	NA	199,901
87	**Avnet**	1,709	1,934	4.5%	2.8%	7.3%	5.7%	227,474
88	**McDonnell Douglas**	1,650	14,589	-0.8%	-0.3%	-1.1%	-0.5%	114,042
89	**National Semiconductor**	1,648	1,648	-12.0%	-12.5%	-24.2%	-22.6%	51,177
90	**Ferranti International**	1,642	1,642	1.4%	0.7%	5.8%	2.0%	66,870
91	**Tandem Computers**	1,633	1,633	11.4%	7.2%	12.0%	10.2%	170,981
92	**Matra**	1,584	3,465	4.8%	2.7%	12.4%	4.6%	163,103
93	**Murata**	1,568	1,568	16.8%	7.7%	NA	NA	74,667
94	**Italtel**	1,568	1,568	NA	5.2%	NA	NA	93,541
95	**Zenith Electronics**	1,549	1,549	-1.1%	-1.1%	-4.3%	-2.9%	48,403
96	**Matsushita Electric**	1,500	5,644	NA	3.6%	NA	NA	NA
97	**Yokogawa**	1,500	1,524	7.4%	4.4%	NA	NA	NA
98	**Schlumberger**	1,500	4,686	11.3%	9.0%	14.5%	11.9%	101,869
99	**E-Systems**	1,463	1,633	7.3%	5.1%	14.8%	12.4%	91,124
100	**Tektronix**	1,433	1,433	4.0%	1.3%	3.8%	2.5%	91,227

NA = Not available NM = Not meaningful

Net income before tax per employee	Fixed assets per employee	Investments as a percentage of revenues	R&D as a percentage of revenues	Capital expenditures as a percentage of revenues	Capital expenditures to net cash flow after dividends	Debt as a percentage of total capital	Current ratio	Fiscal year ended	Country of origin
$16,447	49,469	12.0%	3.8%	8.2%	112.8	79.0%	0.95	12/89	United States
-37,128	16,161	10.9%	8.5%	2.4%	-13.0	47.9%	1.51	12/89	United States
6,499	31,008	9.6%	5.0%	4.5%	79.1	41.1%	1.28	12/89	United States
10,395	29,899	5.8%	2.8%	3.0%	51.7	51.3%	NA	12/89	United States
51,004	74,261	17.4%	4.6%	12.8%	88.0	20.6%	2.33	12/89	United States
5,370	26,299	9.6%	3.5%	6.2%	81.0	47.1%	1.28	12/89	United States
-8,997	31,897	18.9%	8.5%	10.4%	-360.0	45.9%	1.37	6/89	United States
1,302	41,211	16.3%	4.7%	11.5%	198.5	70.2%	1.10	12/89	South Korea
10,454	19,522	4.7%	1.4%	3.3%	44.4	70.4%	1.02	12/89	United States
14,957	96,041	27.1%	1.9%	25.3%	118.1	35.7%	0.74	3/90	Britain
2,102	NA	12.3%	6.4%	5.9%	92.2	28.9%	1.76	12/89	Germany
4,808	21,357	10.4%	6.6%	3.8%	77.9	60.9%	1.24	12/89	Switzerland
17,546	46,997	16.0%	6.2%	9.8%	103.7	33.7%	1.89	3/90	Japan
1,493	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
5,791	21,866	10.4%	3.7%	6.7%	131.8	4.4%	1.30	12/89	United States
18,659	39,088	18.1%	9.0%	9.0%	75.7	14.9%	1.98	12/89	United States
15,100	26,547	12.1%	4.4%	7.6%	65.0	14.8%	3.68	3/90	Japan
29,660	129,477	16.0%	3.9%	12.1%	107.6	33.6%	1.21	12/89	United States
4,762	17,554	9.2%	4.7%	4.5%	50.2	46.1%	1.24	6/89	United States
13,140	16,497	7.1%	3.1%	4.0%	50.3	19.5%	1.86	9/89	United States
16,484	114,317	17.9%	7.1%	10.8%	77.8	17.6%	2.22	12/89	Japan
NA	NA	NA	NA	NA	NA	NA	NA	12/89	Japan
13,064	150,001	20.1%	1.6%	18.5%	106.4	58.7%	0.98	12/89	United States
8,313	35,205	13.5%	3.0%	10.4%	102.3	65.9%	0.75	12/89	United States
31,119	65,086	27.7%	13.2%	14.5%	114.4	10.0%	2.02	12/89	United States
13,074	35,260	10.4%	3.6%	6.8%	64.6	48.0%	1.37	12/89	Italy
3,915	18,057	10.1%	4.0%	6.1%	67.6	3.4%	1.60	3/90	Germany
NA	NA	2.8%	NA	2.8%	24.6	0.0%	2.05	8/90	Japan
-3,256	20,971	2.2%	1.3%	0.9%	56.4	106.9%	1.44	3/90	Netherlands
20,415	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
12,835	38,088	14.2%	6.2%	8.0%	92.6	19.6%	2.46	12/89	Germany
8,670	30,466	18.2%	4.1%	14.1%	161.1	36.6%	1.24	3/90	Britain
8,356	NA	NA	NA	NA	NA	NA	1.47	3/90	Japan
NA	NA	2.3%	NA	2.3%	46.0	57.0%	1.19	12/89	South Korea
7,642	28,800	24.9%	13.3%	11.6%	125.1	28.7%	1.90	6/89	United States
NA	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
10,264	12,496	1.2%	NA	1.2%	34.3	22.5%	5.48	6/89	United States
-938	20,699	8.2%	4.2%	4.0%	224.7	60.0%	NA	12/89	United States
-6,165	21,630	32.9%	16.1%	16.8%	-901.3	6.8%	1.51	5/89	United States
944	18,060	7.2%	NA	7.2%	226.8	66.2%	1.17	3/89	Britain
19,515	46,856	20.8%	12.5%	8.3%	58.9	14.3%	1.96	9/89	United States
7,797	31,325	8.2%	2.0%	6.1%	90.4	63.0%	1.49	12/89	France
12,564	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
NA	NA	16.7%	10.5%	6.2%	182.7	NA	NA	12/89	Italy
-525	6,781	5.5%	3.3%	2.2%	145.1	32.3%	1.89	12/89	United States
NA	NA	NA	NA	NA	NA	NA	NA	11/89	Japan
NA	NA	NA	NA	NA	NA	NA	NA	3/90	Japan
11,537	35,822	18.9%	7.2%	11.7%	83.8	18.2%	1.41	12/89	Netherlands
6,615	13,100	5.6%	2.1%	3.5%	53.5	16.4%	3.27	12/89	United States
3,650	21,929	19.2%	13.2%	6.0%	111.2	33.2%	1.54	5/89	United States

Source: ELECTRONIC BUSINESS

Connector makers buffeted by shifting market factors

In Asia, U.S. companies find their traditional market shares changing. Market leaders Molex and AMP stalk each other across the region

BY JOEL MCCORMICK

Connector makers large and small are dropping like flies in the $16 billion worldwide market, despite industry growth last year of 9%. Record merger and acquisition activity in 1988 doubled in 1989, a trend that is not expected to slow anytime soon.

If they are not gobbling each other up to acquire technology, connector companies are buying wider patches of geography to keep up with customers' shifting of production lines to lower-cost sites in the Americas, Europe, and Asia. The pressure to capture lucrative geography is expected to quicken the merger pace.

Because it is the low-cost manufacturing center, the Asian market is where much of the attention is today. Connector market growth in Pacific Rim countries, where more and more company fortunes are being won or lost, has averaged more than 12% in recent years, twice the U.S. rate. Excluding Japan, the Asian market accounts for a little more than 6% of the world connector market, according to market researcher Fleck International of Huntington Beach, Calif.

While there are an estimated 800 connector companies in the world, predictions are that the number of players could drop to only 100 by the end of the decade. "That makes good headlines," says Ken Fleck, president of Fleck International. By his count, there were 19 mergers or acquisitions in 1987, 21 in 1988, and 42 last year.

The biggest player to be acquired recently was Norwalk, Conn.-based Burndy Inc., the U.S. stalwart founded in 1924, which was taken over by France's Framatome Connector International and joined to FCI's Jupiter and Souriau lines—also buy-outs. Like Amphenol Corp., which is part of LPL Technologies, Burndy continues to operate under its own name.

Connector making is a huge, engineering-intensive business with inordinately little clout. It makes critical components but, with few exceptions, they account for 2% or less of the product's value.

That alone allows customers to call the shots in all sectors—whether military, automotive, telecom, computer, or consumer. "We follow our customers," Molex Inc.'s people say proudly. If they didn't, they'd be as dead as the television and appliance industry that used to fan out from the Chicago area where Molex was born 51 years ago.

The customer is also responsible for forcing consolidation. Apple Computer Inc. started to cut back on its connector suppliers in the early '80s, and the practice is gaining adherents. Hewlett-Packard Co., for instance, wants to cut back its connector suppliers, now numbering more than 30. How far back? "I've heard to five," Fleck says. Customers want to harness all the spread-out spending power—which can run to more than $100 million in HP's case—and concentrate on a small number of connector makers in order to reduce prices and speed delivery.

AMP's William Yiu says Taiwan must upgrade product quality

The Burndy acquisition was done partly to satisfy customers like HP. Framatome ended up with both new technology and wider global reach. It bought a place in Asia, the latest surface-mount technology, and expertise in highly prized half-pitch connector products that Burndy pioneered.

But Asian factories are not always a sure bet, as Amphenol discovered. The company set up its Asian manufacturing base to make flat cable and insulation displacement connection (IDC) connectors in Hong Kong in 1985 when labor was available and inexpensive and the colony boasted a solid infrastructure.

Today, explains East Asia Amphenol marketing director Bob Ko, labor availability is in a decline and hardly cheap. Hong Kong's infrastructure is also being badly shaken by the anxiety over the People's Republic takeover of Hong Kong in 1997.

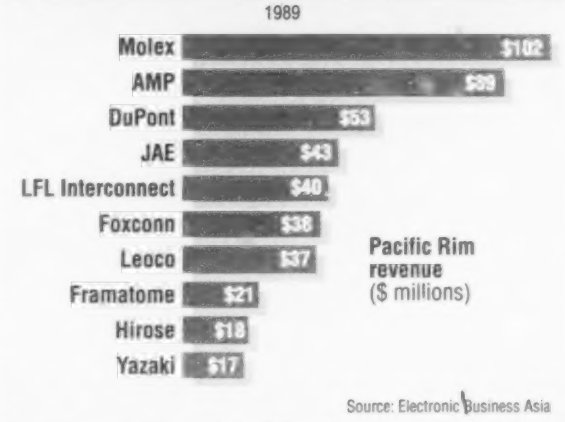
Burndy's regional general manager John Siena admits Hong Kong's changing situation gives him pause. "I'm considering the options," he says. "Right now, I'm sitting on the fence." Burndy still operates as a regional headquarters, even if local sales are only puttering along in Hong Kong's post-Tiananmen Square melancholy.

With company coffers fattened with Framatome cash, Burndy is moving more quickly. Siena says the company is considering setting up a new plant elsewhere, possibly in Malaysia or Indonesia. Plans are being drawn up on the heels of last year's opening of Burndy's Taiwanese production base.

Japan Aviation Electronics Corp. (JAE), Japan's top player in Asia's Pacific Rim grouping, has moving headaches of its own. Marketing manager Daniel Wong at Hong Kong Ryosan Ltd., JAE's exclusive agent in the colony, says factory location is one of his biggest problems in meeting customers on price.

"Japanese production costs are so much higher," Wong says. Even a depreciating yen hasn't helped much, he says. JAE tried to trim costs by moving some production to Taiwan, but the island's fast-rising currency has made the move all but self-defeating, according to Wong.

Top 10 Pacific Rim interconnect suppliers



Source: Electronic Business Asia

Computer slump

There is general agreement that the downturn in the U.S. economy and the flat computer industry isn't going to help any of the struggling connector makers. "Technology has gone beyond what people can digest," says Amphenol's Ko. As a result, most customers are trying to consolidate the technology they have without buying a lot of new products.

Even as the computer industry slows, there is strength in Asia's consumer market, some insiders say. "Japan is very hot," says Molex Japan's marketing director, Yasuhiro Ichijo. He remembers the days when Japan had only a half-dozen domestic connector companies and not the 40-plus he has to contend with now.

Acknowledging Molex's position as fifth in Japan's overall connector sales, Ichijo still insists, "We're number one in the consumer market. AMP Inc.'s weak point is that it has to defend its position across the whole market—automotive, data, and consumer sectors."

Ichijo figures Molex occupies a very strong position. "Our customers are making more radio cassette recorders with CD players, more camcorders, more VCRs. These products have many more connectors because the circuitry is complex," he explains. That means Molex ends up selling higher-value devices and many more of them.

Despite a flat computer market, Burndy's Siena is upbeat. "I expect the PC market will soon come alive," he says. That opens up business for Burndy's range of IBM Micro Channel and Extended Industry Standard Architecture bus connectors. And while it is waiting, Burndy can deploy marketing troops in other areas. "I'm excited about telecom in China and Korea and opportunities in the industrial [automation] area," Siena says.

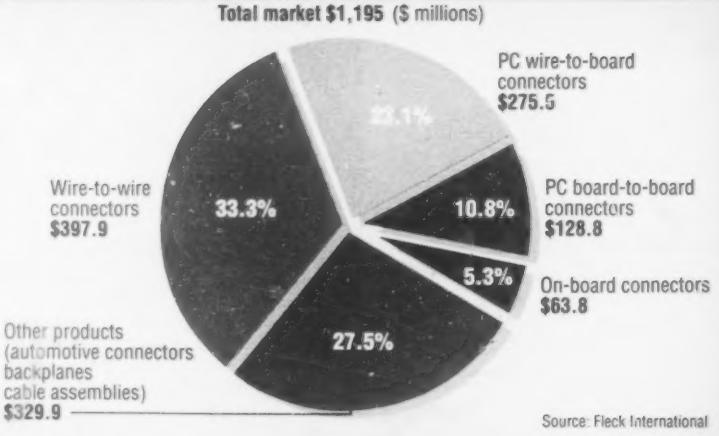
Meanwhile, JAE waits out the current computer slump, caused to some degree by Intel Corp.'s delay in shipping 80386 chip sets as well as the general downturn in the U.S. economy. Ryosan's Wong refused to hazard sales projections for JAE connectors in Hong Kong.

Is he encouraged by all the talk about a boom in network products as computer users start to consolidate their computer base? Not really. "People have been talking about networks for a long time," Wong says.

Foxconn, Taiwan's largest connector maker and sixth-ranked in the Pacific Rim, faces leaner times, too. Kok Chiu, sales manager at Hong Kong's Bestronic Industrial Co., which serves as Foxconn's exclusive agent in the colony, says the company hopes to achieve 8.5% growth this year, only half of last year's growth. Chiu says the company is banking on an upturn in the U.S. economy that should see growth return to double digits by 1991.

But AMP's regional marketing manager William I.S. Yiu cautions it may not be smooth sailing for Taiwan connector companies even if the U.S. economy bounces back. He says Taiwan's computer companies will have to shift to higher-quality components, connectors included, if they hope to earn mid- and top-end

Connector sales in Pacific Rim/Asia by product



Source: Fleck International

product status.

Molex-Nanco Ltd.'s managing director, Don Davies, sees opportunities—although not an abundance of them in Hong Kong—with generally rising corporate demand for network products and increased vendor demand for the higher-density products Molex can make. Declining to offer projections on Molex regional fortunes for 1990, Davies says only that he expects the company to exceed the industry average.

Molex opened its China operation near Hong Kong, a joint venture with Dongguan Tong Da Industries, just after the country started going to pieces in the aftermath of last year's Tiananmen Square massacre. But there has been a surprisingly good recovery, Davies says. "We're budgeting for growth. Of course, the operation is in its infancy."

Still, fallout from the massacre rattled Hong Kong, sending electronics makers on the prowl for new sites in Malaysia, Thailand, and elsewhere. Molex, though, has little to lose on this score because it can sell connectors to migrating companies from practically anywhere. The company has Asian operations in Japan, Taiwan, South Korea, Hong Kong, China, Singapore, Malaysia, Thailand, and India.

Marketing director Bob Ko at Amphenol: "Technology has gone beyond what people can digest"

"Our worldwide organization is of particular interest to multinational customers as they look for suppliers throughout the world," said Molex's founding chairman John Kriehbiel, Sr. in his 1989 report to shareholders.

In these turbulent times, Asian leaders Molex and AMP have adopted different approaches to managing their global businesses. Molex, with almost three-quarters of its volume generated offshore, is of the "you-know-best" school with its network of "largely autonomous" affiliates. "We put decision making as close to the customer as possible," CEO Fred Kriehbiel once explained.

With 60% of the company's volume offshore, AMP takes what it calls a team approach. Researcher Fleck salutes both Molex and AMP for solid management skills and low staff turnover. Senior managers are often 30-year veterans, while most middle managers claim at least 20 years' service. Molex chairman Kriehbiel has been around since he founded the company in 1938.

Entrenched as management is, they're not bashful about changing strategy. "Distribution used to be a dirty word at AMP," says Fleck. Now, the company says its distributor-based sales are the second highest in the United States. Fleck predicts AMP will eventually take over from worldwide top-ranked Amphenol.

Factory sites located over currency boundaries can also save sales. AMP's Yiu says his company produces complete product families in so many locations that he feels insulated from fierce currency swings. He

AMP and Molex fight for top Asian spot

Last year, AMP Inc. got a slap in the face. The number-one ranked worldwide connector maker found its lead over fifth-ranked Molex Inc. reversed in the Asia/Pacific market last year as Molex took the top spot, according to Fleck International, a research firm in Huntington Beach, Calif.

Molex's gains come from its historical predicament. The Lisle, Ill. company moved to Southeast Asia before top-ranked AMP because its appliance-making customers, most of them within a 500-mile radius of Chicago, moved offshore, explains Ken Fleck, president of Fleck International. Higher-end manufacturers in the computer and telecommunication business—which AMP relied on—weren't forced to look for less labor-costly sites in Asia until later.

And when Japan became too expensive for its local customers to continue low-end operations, Molex moved with them into Japan, Taiwan, South Korea, Hong Kong, China, Singapore, Malaysia, Thailand, and India.

One of Molex's competitors argues Molex has too many locations for its own good. Suyin Corp.'s Hong Kong-based sales manager Andrew Ma says Molex stretches out deliveries due to its piecemeal production methods. "They do one thing here, one thing there, moving the product into China, then back again to Hong Kong," Ma says.

How does AMP respond to Molex's new market ranking? "Market data can be misleading," insists AMP's regional marketing manager William I.S. Yiu. Yiu reckons that roughly one-third of a connector's cost is the terminal—that is, the actual connector—while the balance is due to other factors like harnesses. On that basis, he claims that AMP's $89 million in Pacific Rim connector revenue far outpaces Molex's pure-play connector revenue, although Molex earned $102 million in 1989.

One Wall Street analyst suggests the AMP-Molex equation was off by "tens of millions of dollars" and that AMP is clearly in the lead in the Far East outside Japan. Year-to-year comparisons are skewed, he says, because AMP's business year was shortened by one month, ending November instead of December. He argues AMP's Far East volume in 1989 was really closer to $150 million, while Molex was in the $110 million range.

"In round figures, AMP should see $175 million, Molex around $140, in the Far East except Japan in 1990," he says. □

hints that a new plant may be built in Thailand, where AMP claims 30% market share.

Sales receipts can be difficult to predict when companies have to deal in a crosshatch of currencies. AMP and others, for example, enjoyed high single-digit or better growth in local currencies in 1989 but suffered setbacks when figures were translated back into strengthened U.S. dollars.

"Growth was 11% in local currencies, but only 5% in U.S. dollars," AMP chairman Harold McInnes wrote in his report to shareholders. "Had exchange rates stayed at 1988 levels, sales would have netted $90 million more than they did last year." □

SINGAPORE ELECTRONICS

Who's who on Singapore's top 10 electronics list

MOST OF SINGAPORE'S homegrown electronics companies are still small by international standards and still privately held. But as this *Electronic Business Asia* listing of Singapore's top 10 indigenous companies shows, the highest-ranked players are growing up.

As Singapore's government ushers in a new "era of entrepreneurship" to help foster growth in the $13 billion domestic electronics industry, these leading companies are positioning themselves for a more independent international role. As a result, subservience to multinational corporations is being replaced by in-house product development, and private ownership is giving way to publicly traded stock.

Consider seventh-ranked Essex Group. Dissatisfied with their roles as subcontractors, brothers Benjamin and Patrick Ngiam decided to stop making circuit boards and begin selling their own brand of PCs in 1985 followed by point-of-sale terminals in 1989. The company, whose management now includes three more brothers and a sister-in-law, has grown rapidly since then and now distributes its products in 36 countries. By next year Essex sales are expected to reach $50 million, up from $33 million this year. And by 1991 the company expects to be ready for a public stock offering.

Nearly all the top 10 electronics companies in this island nation—from the huge government-owned Singapore Technologies Industrial Corp. (STIC) to personal computer software retailer Challenger Technologies Pte. Ltd.—are poised to go public within the next five years. STIC, in fact, engineered public offerings for two of its divisions in June.

"It is inevitable as the critical mass grows here in terms of technology that native companies will look more to the future," says David Guest, research director at Hoare Govett Securities in Singapore. "There's a limit to how big you can get as a supplier. What we'll see are these smaller companies beginning to mature and relate to multinational corporations in ways other than just as simple suppliers."

ANN MARIE ANGEBRANDT in Hong Kong

Singapore's top 10 in electronics

(Total sales, $ millions)	1988	1989
1. Singapore Technologies Industrial Corp. Manufacture of computer, software and semiconductors; leasing; investment	216	350
2. Wearnes Technology Pte. Ltd. Manufacture and sale of PCs and peripherals; contract assembly	132	194
3. PCI Inc. Manufacture and sale of printed circuit boards, LCD; contract manufacturing	43	60
4. Eltech Electronics Pte. Ltd. Contract manufacturing	41	55
5. Goh Electronics Singapore (GES) Manufacture and sale of PCs; OEM computer assembly	33	43
6. Singatronics (Group) Ltd. Manufacture of electronic health care products; PCB assembly; electronic toys and games	35	41
7. Essex Group Manufacture and sale of PC products; computer manufacturing; OEM assembly	17	33
9. UIC Electronics Pte. Ltd. Contract manufacturing	11	28
8. Challenger Technologies Pte. Ltd. Franchise retailer of PC products; computer manufacturing; OEM assembly	27	30
10. KT Technology Manufacture and sale of PCs; OEM assembly	15	24

Source: *Electronic Business* Asia

KOREAN DRAMS

Samsung keeps pace in DRAM development

SAMSUNG ELECTRONICS Co. recently announced the successful development of a prototype 80-nanoseconds 16-megabit dynamic RAM chip, with commercial production scheduled for the second half of 1991.

Samsung, South Korea's largest semiconductor producer, was the first South Korean chip maker to ship 4Mb DRAMs in 1989. Analysts say the company's announcement of a 16Mb DRAM prototype less than a year after its launch of the 4Mb DRAM is intended to reassure customers that the company is keeping pace with leading Japanese and U.S. DRAM manufacturers.

Samsung is hoping that future demand for high-end PCs and workstations, telecommunications equipment, and high-definition television will provide a lucrative market for its DRAM chips well into the 1990s.

IBM, NEC, Toshiba, Matsushita, and Hitachi introduced prototypes or engineering samples of 16Mb DRAMs earlier this year. Hitachi Ltd. is developing a commercial 16Mb DRAM chip in a joint effort with Texas Instruments Inc., and it claims to have produced a lab prototype 64Mb DRAM. But a memory chip of such high density isn't expected to be commercially viable until 1992 at the earliest.

Yong-Kwan Kim of Samsung's strategic planning division for semiconductor business expects prices for the 16Mb DRAM to be just under $300 by the time Samsung gears up for commercial production next year. Samsung Electronics' semiconductor sales in 1989 reached $1.3 billion, up 44% over 1988. Given soft demand for DRAMs in 1990, Kim expects the semiconductor division's sales to grow just 8% this year, to $1.4 billion.

GEOFF CRANE in Seoul

Videoconferencing moves toward the desktop

Market growth is fueled by shrinking costs of equipment and transmission and the emergence of an international standard

BY DWIGHT B. DAVIS

A growing number of corporate executives, engineers, and salespeople are becoming TV personalities of a sort. Shows starring hundreds of businesspeople now play daily on company video screens, thanks to the newly accessible technology of videoconferencing.

In the early 1980s, large aerospace and computer companies, along with other select members of the *Fortune 500*, built expensive videoconferencing rooms. Today, lower equipment and transmission costs, as well as an incipient international standard, are making the technology practical for the business masses.

Worldwide unit shipments of videoconferencing equipment will grow from about 5,400 this year to more than 567,000 in 1996, predicts Market Intelligence Research Corp. in Mountain View, Calif. Vendor revenue during that time will increase from about $113 million to more than $1.4 billion, says MIRC.

The current generation of videoconferencing systems comes in portable "roll-about" configurations and functions as a departmental resource, but the technology will evolve in much the same way that computer technology did, says Ronald D. Baker, director of marketing programs at PictureTel Corp. in Peabody, Mass. While the first computer systems were expensive mainframes and served as corporate-level resources, Baker explains, videoconferencing systems will migrate to users' desktops within two years.

Face-to-face, for a price

Prices for videoconferencing equipment have dropped sharply in recent years. A codec (coder/decoder)—the heart of the system—cost about $165,000 in 1982, says John Tyson, president of Compression Labs Inc. (CLI), in San Jose, Calif. And a full-blown videoconferencing room—containing a codec, cameras, monitors, and audio equipment—cost $500,000 or more. By contrast, today's roll-about systems contain all the videoconferencing essentials in a refrigerator-size package and cost as little as $50,000.

Earlier systems also required high-bandwidth digital lines to carry the video signals that the codec had first digitized and compressed. They operated at T1 rates (1.544 megabits per second) and used expensive satellite links or dedicated terrestrial lines. Today's systems take advantage of the improved video compression algorithms that provide an acceptable picture quality at data-transmission rates that are as low as 56 kilobits per second (kbps).

These dropping transmission requirements mesh nicely with services now available from local and long-distance public telephone networks. Companies can dial switched 56-kbps digital lines (AT&T recently announced a switched 384-kbps service) and can save significantly. Several years ago, a coast-to-coast videoconference over dedicated satellite or terrestrial lines, for example, cost $1,000 or more per hour. Today, the transmission costs for coast-to-coast videoconferencing over tandem 56-kbps lines is just $15 an hour.

Just four or five companies dominate the videoconferencing marketplace, with CLI working hard to retain its preeminence in the area. But recent technological and market changes have blurred business boundaries. CLI pioneered the field in the United States and was able to make its equipment the de facto standard among several of the early aerospace and government users.

It took the arrival of low-cost roll-about systems, notably those from PictureTel, to crack CLI's armor. PictureTel got a jump on CLI at the low end—units operating at transmission rates of 56 to 384 kbps—and in 1989 claimed to ship more codecs than any other vendor.

Videoconferencing, most often touted as a way to cut travel costs, is proving its worth as a marketing and product-development resource

Today, the bulk of videoconferencing action has shifted to the low end, with PictureTel, CLI, GPT, VideoTelecom Corp. in Austin, Tex., and several systems integrators all offering products in the 56- to 384-kbps range. Japanese vendors such as Fujitsu are moving into the U.S. market with low-end products of their own. Most of the major videoconferencing players started out as codec manufacturers and later moved into complete systems.

Now the playing field is shifting under the influence of a videoconferencing standard emerging from the Consultative Committee for International Telephony and Telegraphy (CCITT). The standard is known both as Px64 (essentially an umbrella standard) and H.261 (a substandard that defines a means to communicate and decompress a compressed video signal).

The goal of H.261 is to provide interoperability among different vendors' videoconferencing equipment. Without such a standard, the only way users of different systems can communicate is by going through a "codec farm" like the one operated by public carrier US Sprint. The carrier converts an incoming signal to a form the receiving codec can decipher.

PictureTel and VideoTelecom have already demonstrated the pending Px64 standard in a videoconference linking their equipment. All the major vendors plan to support the standard. Each views Px64 as the lowest common denominator, however, and plans to continue supporting and improving their own proprietary codec algorithms.

Videoconferencing frequently is justified as a way of cutting travel costs. About 70% of employee travel is intracompany, notes CLI's Tyson, which means that a company with an internal videoconferencing network can cut back its travel budget. Even though 30% to 40% of a system's cost is typically repaid in travel savings, however, it's risky to sell videoconferencing solely on the basis of those savings, says T.C. Browne, vice president of the Conference and Satellite Systems Division of Sony Corporation of America. Sony, for several years a systems integrator of CLI's equipment in Asian and European markets, is now marketing its systems in the U.S.

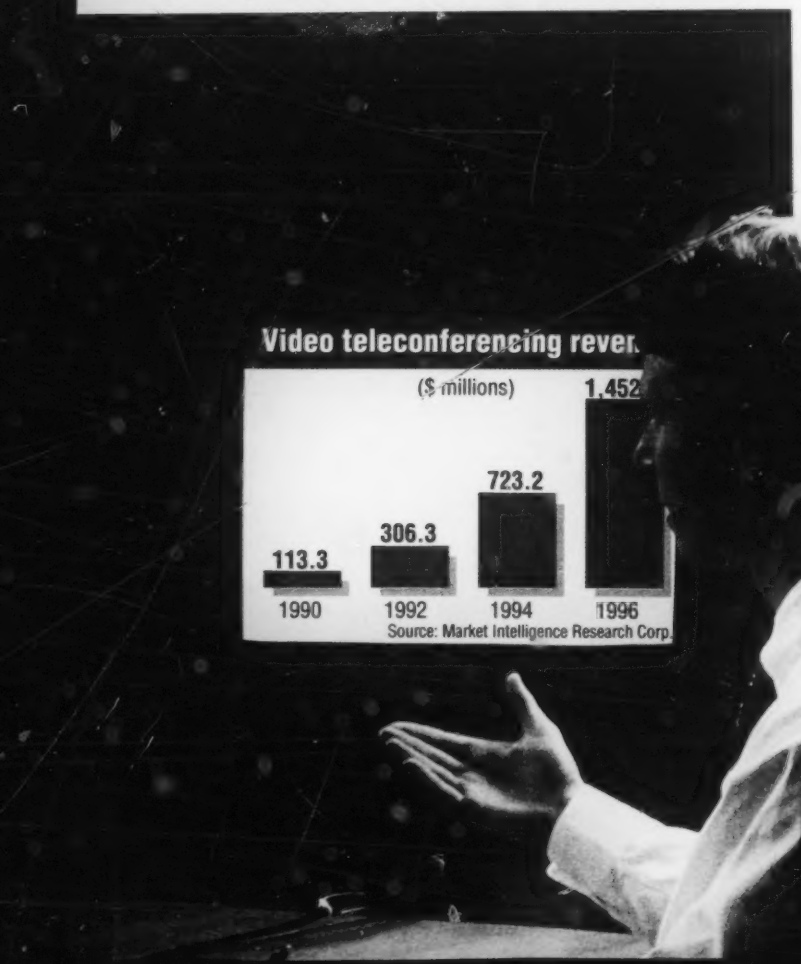
"It's tough to guarantee that a company will save money with videoconferencing because people won't have to get on planes," Browne says. "That's out of the vendor's control." In any case, most users soon find that the system provides benefits well beyond travel savings, such as faster product development.

Beyond video

While the CCITT standard is expected to stimulate the market's growth, videoconferencing ultimately has much more to address than video alone. "The audio is the worst part of videoconferencing," says James Keating, marketing manager for Video Communications Services within Pacific Bell's Data Communications Group. The San Francisco-based Bell operating company is bundling CLI equipment with various communications options.

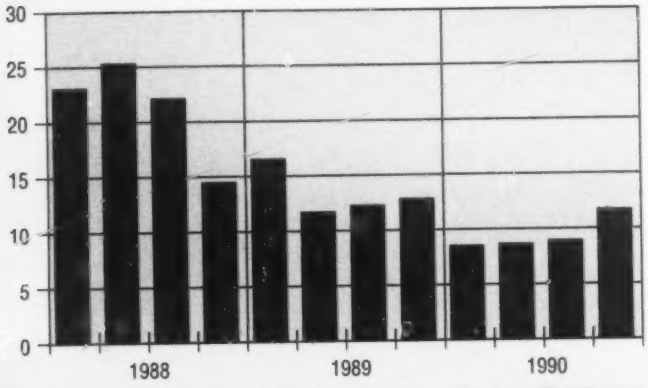
The proliferation of rollabout systems that operate in "hard" or non-conditioned rooms exacerbates the audio problem. "If the video fails, you talk," says Todd Clayton, vice president of marketing at Video-Telecom. "If the audio fails you walk." VideoTelecom and PictureTel have developed an echo-cancelling circuitry to improve sound and differentiate products.

Beyond video and audio lie multi-point conferencing, graphics transmissions, picture-within-a-picture windowing, links to databases and remote control of distant cameras. □



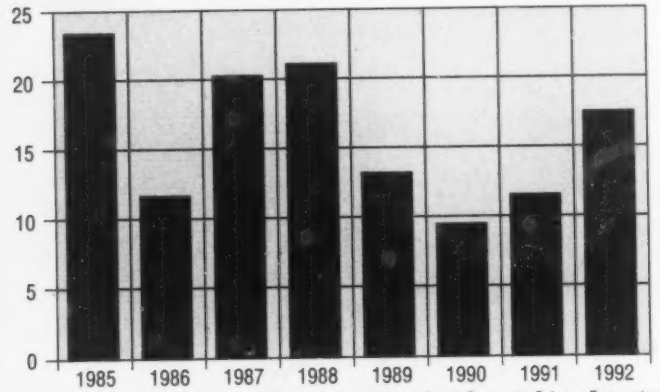
While production is still heading up...

Computer & office equipment production (percentage change from year ago)



...annual growth rates are lowest since 1975

Computer & office equipment production (percentage change from year ago)



Source: Federal Reserve Board; Forecasts: Cahners Economics

Computer output growth rate hits single digits

The computer industry is dealing with the strains of the downturn in the business cycle and the drop in business confidence. In July output from U.S. computer manufacturers grew 0.8% from June, and the preliminary figure for August records another 0.4% gain from July. These levels place output 8% ahead of last year.

Nevertheless, these year-to-year growth rates are some of the lowest the industry has experienced since the economy-wide recession in 1975. The U.S. computer industry had grown accustomed to double-digit output gains for most of the last 15 years.

Cahners Economics doesn't expect this slowdown to last much longer. Prior to the Middle East crisis, new orders for computers and office equipment rose above expectations. In July of this year, orders rose 7.6% from June—the largest monthly gain since March 1989. Further, the industry has kept a watchful eye on inventory. The quarterly average inventory-to-shipments ratio for the computer industry moved no higher than 2.22 in the final quarter of 1989. In the second quarter of 1990, the inventory-to-shipments ratio came in at only 2.11—far below its peak of 2.7 in 1985.

The growth trend is headed decidedly upward. However, the Persian Gulf situation could knock some of the wind out of the next business cycle upswing.

Consequently, my 1990 production forecast calls for just 9.5% growth, the lowest annual increase since the recession of 1976, but 1991 and 1992 will mark a return to stronger growth with annual gains of 11.6% and 17.5%, respectively.

BY MADELINE FRANCHI

Computer market database

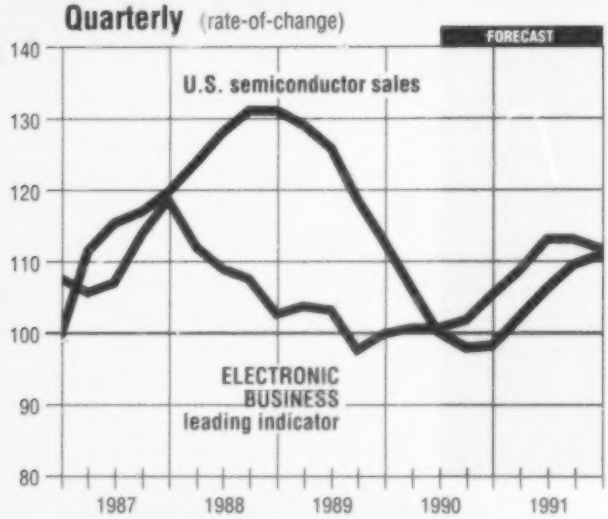
Latest quarter: 2nd quarter, 1990	Latest quarter	Previous quarter	Change	Year ago	Change	Next year	Change
Industrial production (SA, 1987=100, qtr. average)	148.80	144.80	+2.76%	136.90	+8.69%	163.60	+9.95%
Shipments (SA, $ millions, qtr. total)	$17,837	$18,022	-1.03%	$17,865	-0.16%	$18,705.9	+4.87%
New orders (SA, $ millions, qtr. total)	$17,598	$17,817	-1.23%	$16,870	+4.32%	$19,493.6	+10.77%
Unfulled orders (SA, $ millions, end of qtr.)	$12,214	$12,453	-1.92%	$12,206	+0.07%	$11,958.4	-2.09%
Inventory-to-shipment ratio (SA, end of qtr.)	2.01	2.01	—	1.95	—	2.10	—
All employees (thousands, end of qtr.)	458.30	463.90	-1.21%	476.90	-3.90%	433.10	-5.50%
Production workers (thousands, end of qtr.)	150.40	154.20	-2.46%	155.00	-2.97%	139.63	-7.16%
Business purchases (SAAR, current $ billions)	$39.76	$40.68	-2.26%	$40.16	-1.00%	$43.05	+8.27%
Business purchases (SAAR, 1982 $ billions)	$123.85	$124.03	-0.15%	$114.71	+7.97%	$141.78	+14.48%

SA = seasonally adjusted; SAAR = seasonally adjusted annualized rate; all other data is not seasonally adjusted

Data sources: Federal Reserve Board, U.S. Bureau of the Census and U.S. Bureau of Labor Statistics
All data for SIC 357, computers and office equipment. Forecasts: Cahners Economics

ELECTRONIC BUSINESS leading indicator

Quarterly (rate-of-change)



To obtain your complimentary copy of a 12-page background paper on the ELECTRONIC BUSINESS leading indicator, please contact Linda S. Keehn at Cahners Publishing Company, 275 Washington St., Newton, MA 02158-1630, USA, telephone (617) 630-2119, fax (617) 630-2100.

Monthly (rate-of-change)

The ELECTRONIC BUSINESS leading indicator languished in August at 101, the fifth consecutive month of a figure between 100 and 101. Somewhat encouraging was the fact that the leading indicator did not plunge as a result of the Gulf crisis. But as long as the indicator remains inactive, it becomes less and less likely that semiconductors will make a strong recovery later this year or that electronic equipment will recover next year. According to the indicator, the industry is in a holding pattern and isn't likely to break free soon.

Source: Cahners Economics

Electronics industry indicators this month

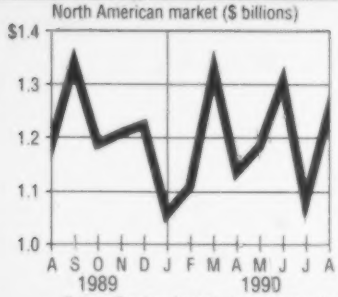
	Latest month	Previous month	Year ago	1989 average
ELECTRONIC BUSINESS leading indicator (rate-of-change, August)	101.0	101.0	97.1	100.9
U.S semiconductor bookings ($ millions, 3-month average, August)	$1,223	$1,287	$1,170	$1,205
Weekly hours of semiconductor production workers (monthly average, July)	39.3	40.5	39.1	40.1
Electronic component leadtime index (1977=100, September)	80.6	85.9	89.2	102.5
S&P's semiconductor stock price index (1970=10, monthly average, August)	64.1	78.2	57.5	54.7
Change in electronic components inventories ($ millions, SA, July)	+$175	-$10	-$178	-$12.8
Contracts and orders for plant and equipment ($ billions, SA, July)	$43.6	$40.0	$46.0	$43.4

SA = seasonally adjusted, all other data are not seasonally adjusted

Sources: Semiconductor Industry Association, U.S. Bureau of Labor Statistics, *Electronics Purchasing* magazine, Standard & Poor's, U.S. Commerce Department, U.S. Bureau of Economic Analysis

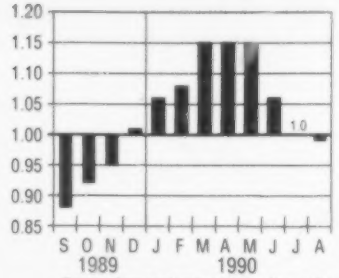
Semiconductor sales

North American market ($ billions)



Source: Semiconductor Industry Association

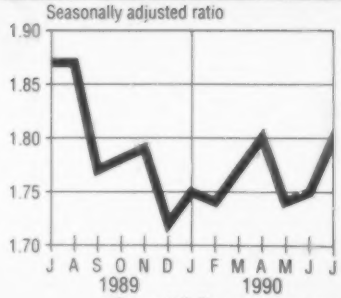
Semiconductor book-to-bill ratio



Source: Semiconductor Industry Association

Component inventory-to-shipments

Seasonally adjusted ratio



Source: U.S. Commerce Department